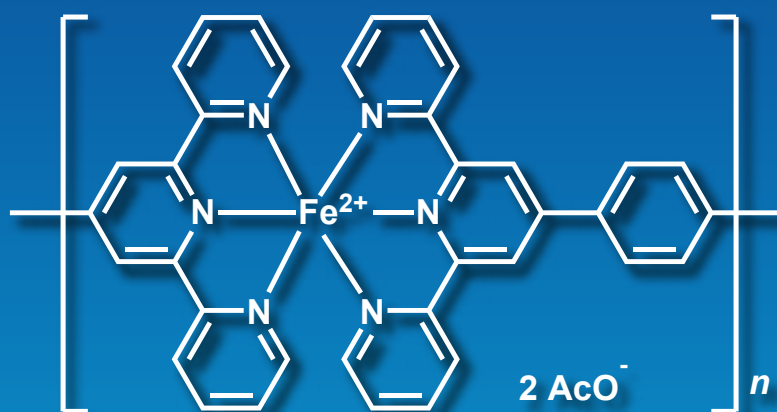


New

MATERIALS



Metallo-Supramolecular Polymer with Electrochromic Properties



Poly(Fe-btpyb) Purple

1g

[P2789]

Advantages

- Displays keen color change upon applying voltage (electrochromism)
- Maintains the displayed color while power off (memory effect)

Application

Potential applications toward light control glass and light control film



3 V
→

←
-3 V



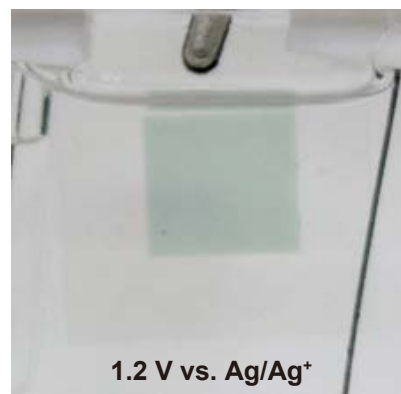
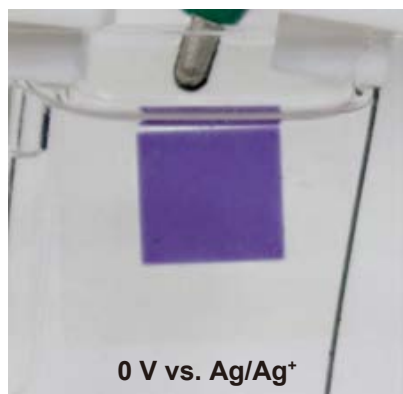
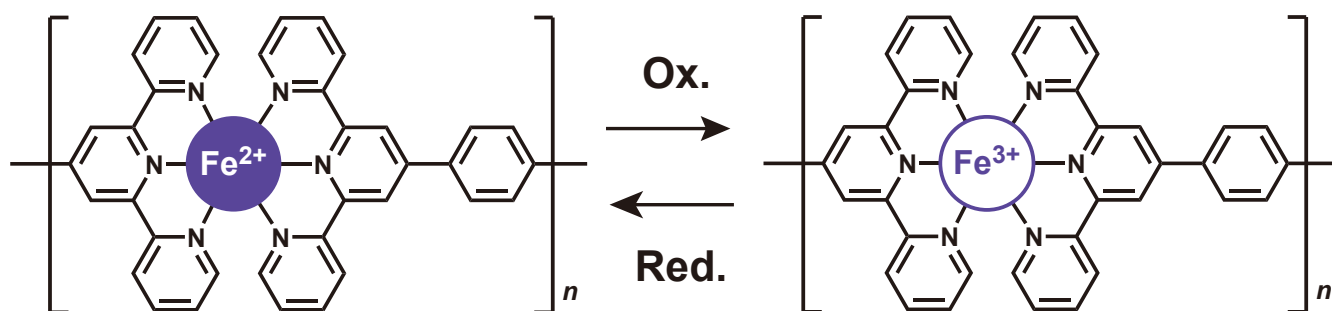
Related Literature M. Higuchi, *J. Mater. Chem. C* **2014**, 2, 9331. DOI: <https://doi.org/10.1039/C4TC00689E>

This product was developed for research and development use.
Please contact National Institute for Materials Science (NIMS), Japan. (contract_administrator@nims.go.jp)
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Electrochromism

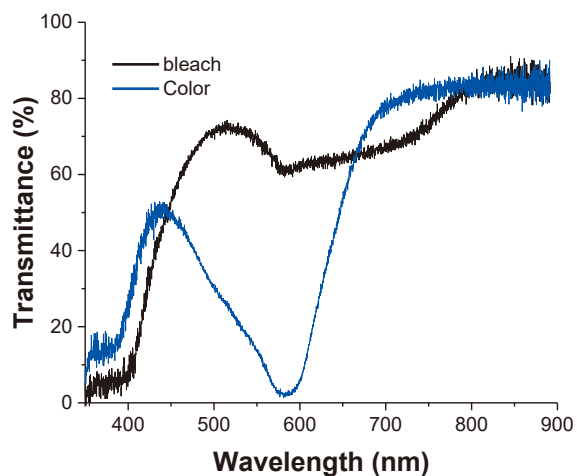
Mechanism of Chromism

Poly(Fe-btpyb) Purple is a purple powder. The color is caused by an absorption around 580 nm of metal-to-ligand charge transfer (MLCT) transition from Fe(II) to the ligand. The MLCT absorption disappears by the electrochemical oxidation of Fe(II) to Fe(III).¹⁾

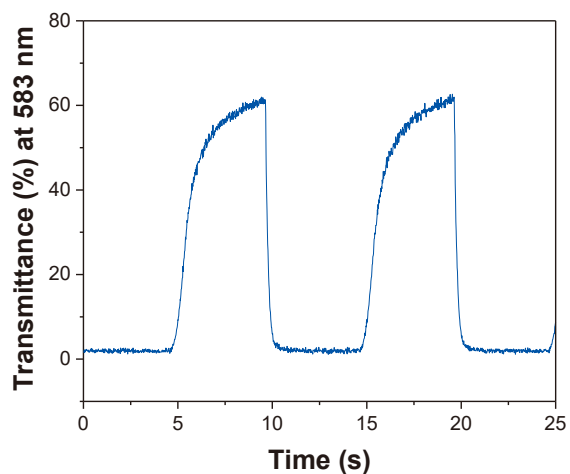


¹⁾ Working: an ITO glass coated with Poly(Fe-btpyb) Purple
Counter: Pt wire; Reference: Ag/Ag⁺; Electrolyte: an acetonitrile solution with LiClO₄

Transmittance change by applying voltage

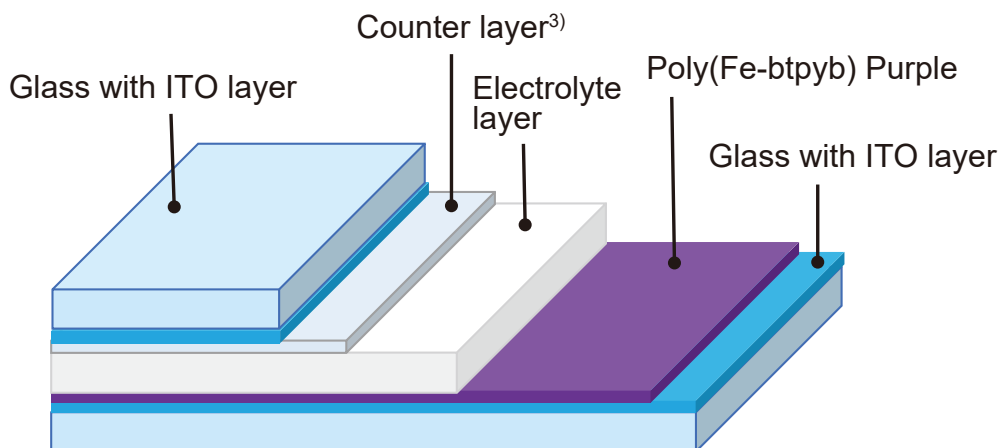


Cycling characteristics of transmittance change

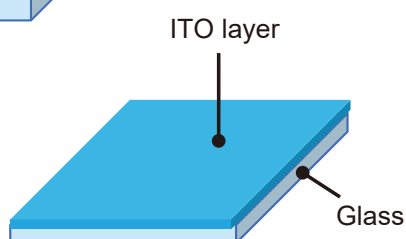


All the pictures and data were provided by National Institute for Materials Science (NIMS), Japan.

Electrochromic Device Fabrication



- ① Prepare two ITO glasses (glasses coated with ITO)
(Size: 10 × 10 cm; Sheet resistance: <math><10 \Omega/\text{sq}</math>)

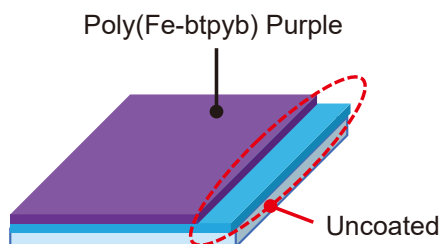


- ② Coat Poly(Fe-btpyb) Purple on ITO glass either by spray or spin coating the methanol solution (3 mg/mL)^{2),3)}

²⁾ An uncoated part (5-10 mm) is required to connect with a battery

³⁾ Counter layer is prepared on another ITO glass, if needed

(Ref. S. Mondal, M. Higuchi et al., *Sol. Energy Mater. Sol. Cells* **2019**, 200, 110000.)

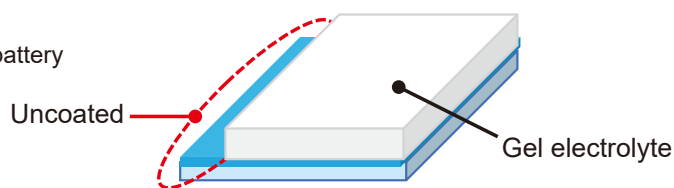


- ③ Load the gel electrolyte^{4),5)} on another ITO glass and spread it uniformly⁶⁾

⁴⁾ A mixture of LiClO_4 (1.5 g), propylene carbonate (10 mL), and PMMA powder (10 g)
(Degassing by stirring the gel for 2 h at rt under reduced pressure is recommended before use)

⁵⁾ Amount: 10-20 g

⁶⁾ An uncoated part (5-10 mm) is required to connect with a battery

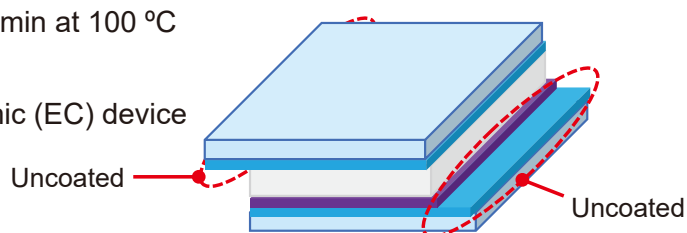


- ④ Bond the two glasses of ② and ③ together so that the Poly(Fe-btpyb) Purple layer and the gel electrolyte layer face each other⁷⁾

⁷⁾ Stagger and stack the two glasses so that the uncoated parts are at the opposite side each other

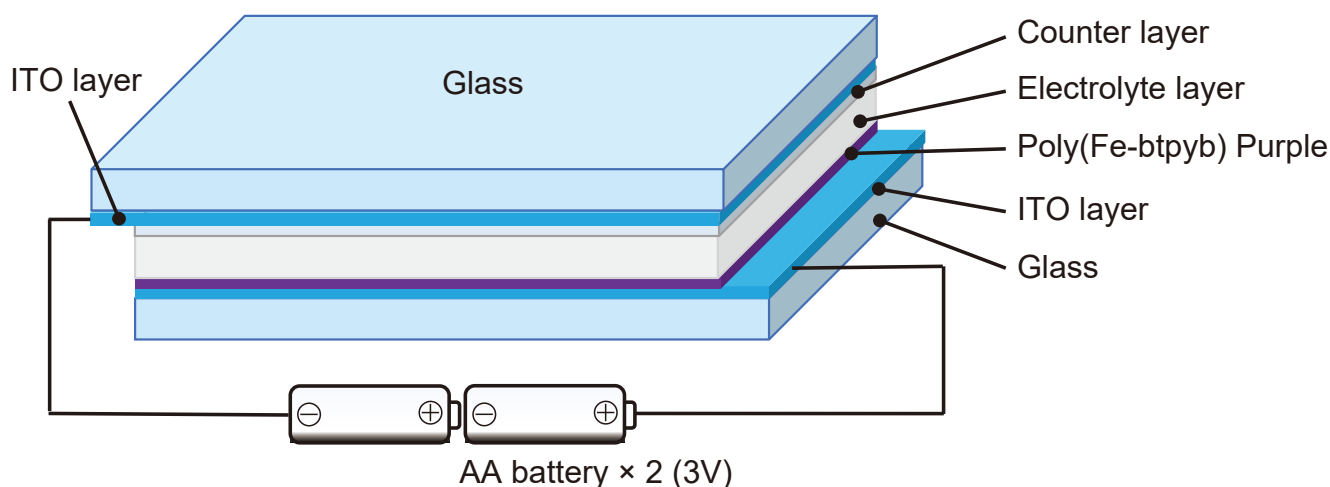
- ⑤ Clip the stacked glasses and anneal it for 5 min at 100 °C

- ⑥ Remove the clips to obtain the electrochromic (EC) device



Metallo-Supramolecular Polymer with Electrochromic Properties

How to Drive Electrochromic Device

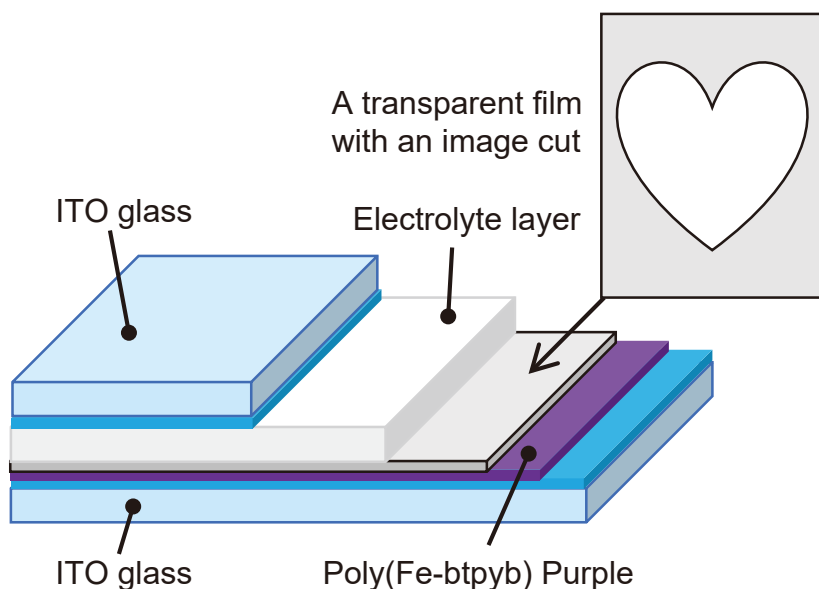


- ① Prepare two AA batteries, a battery holder, and two alligator clips
- ② Connect the series-connected batteries to two bear parts of the ITO glasses using the alligator clips.
- ③ The original purple color disappears when (+) of the battery is connected to the ITO glass coated with Poly(Fe-btpyb) Purple.⁸⁾

⁸⁾ Power off once the color change ends, to prevent the degradation of the device

One Example

An image can be displayed on the device when a transparent film with the image cut is put on a Poly(Fe-btpyb) Purple layer during the device fabrication.⁹⁾



⁹⁾ The film-coated part does not show any color changes, because the film prevents anion transfer to the Poly(Fe-btpyb) Purple layer.

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